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## **Direct evidence of SARS-CoV-2 in gut endothelium**

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IMAGING IN INTENSIVE CARE MEDICINE



# Direct evidence of SARS-CoV-2 in gut endothelium

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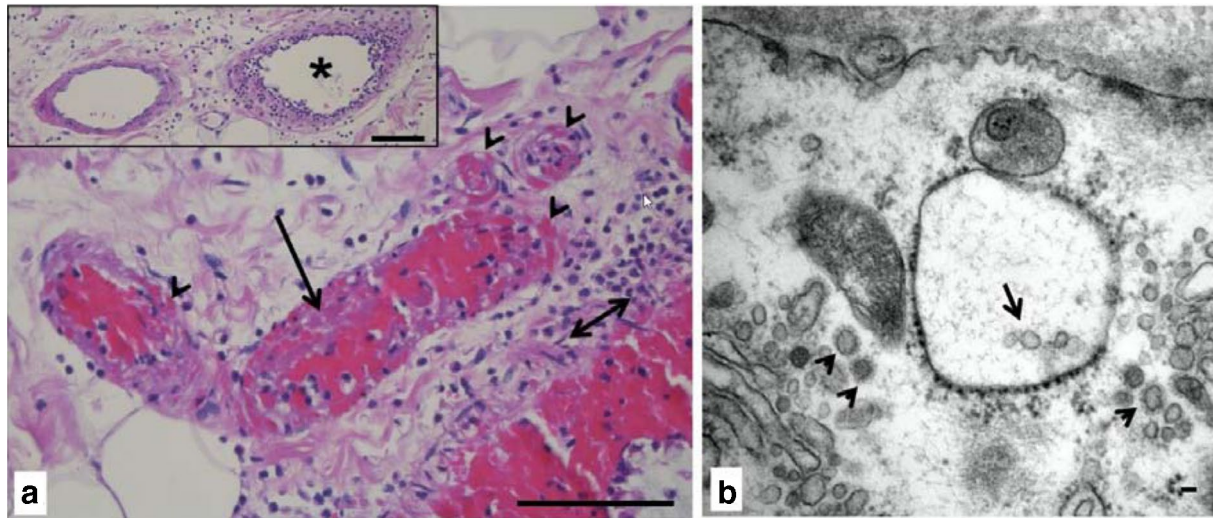
The clinical observation that Coronavirus disease (COVID)-19 can affect various organs has recently been attributed to SARS-CoV-2 infection of endothelial cells leading to endothelialitis and microvascular coagulation. We extend this knowledge by showing pathological findings from a bowel specimen. A previously healthy, 43-year-old male developed flu-like symptoms after SARS-CoV-2 contact. Two weeks later, he presented with respiratory failure requiring endotracheal intubation, mechanical ventilation and extracorporeal membrane oxygenation. The clinical course was protracted with slow recovery of pulmonary function and persistent signs of systemic inflammation. Four weeks after intubation, he developed acute non-obstructive mesenteric

ischemia and emergency hemicolectomy was required. Histological examination revealed severe endothelialitis and multiple microthrombi in particular in the venous vascular bed (arrows in Fig. 1a). Electron microscopy showed multiple SARS-CoV-2 viral particles in the large bowel endothelium (Fig. 1b)—which is well-known for its higher than average expression of the entry receptor ACE-2. Of note, non-obstructive bowel necrosis has been increasingly recognized as an emerging complication of severe COVID-19. It strikes us that we found abundant and seemingly intact viral particles in the bowel endothelium about 8 weeks after initial infection when the virus was already undetectable in respiratory and blood specimens.

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**Fig. 1** **a** Submucosal vessels of the hemicolectomy specimen show severe endothelialitis predominantly in venous vessels (asterisk in inset) with thrombus formation (long arrow) and bleeding into vessel wall (arrowheads). H&E stain, double arrow denotes lamina muscularis mucosae, bars represent 100 µm. **b** Electron microscopy of a venous endothelial cell reveals coronaviruses (small arrows) and vesicles containing virion particles (arrow). Tannic acid contrasted epon embedded specimen, bar represents 50 nm

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#### Compliance with ethical standards

#### Conflicts of interest

The authors declare they have no conflicts of interest.

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